Process Design Considerations of Large Central Platform for LW3-1 Deepwater Gas Development

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ABSTRACT

In the deepwater gas field development, by installing subsea production system in deepwater gas field area and building central processing facilities in shallow water area to achieve regional development of deep and shallow water gas fields, not only the supporting requirement of deepwater gas field is met, but also the economic benefit of shallow water gas field can be improved. The gathering transportation and processing engineering is composed of central processing platform and oil and gas transportation pipeline in shallow water area and gas plant of onshore terminal. The gas field in deepwater area is developed by subsea production system, and the fluid is transported to the central processing platform in shallow water area by deepwater pipeline. Based on the process system in the LiWan 3-1 Deepwater Water Gas Field Development project including LW3-1 and PY34-1/35-2/35-1 gas fields development, the paper further studies issues of the central platform process design of deep water gas field development, and illustrates the main points of process design for central processing platform in deepwater gas field development, which is expected to provide reference to process design of similar engineering.

KEY WORDS: Deepwater natural gas development; Central processing platform; Process design; Energy saving and consumption reduction.

INTRODUCTION

Deepwater Rich natural gas exists in the eastern area of South China Sea where the Panyu 30-1 gas field is under production while Liwan (LW) 3-1 gas field and Panyu (PY) 34-1/35-2/35-1 gas fields are under development. More potential gas field reservoirs have been found in both deepwater and shallow water areas.

The LW3-1 gas field development has challenging gathering transportation and processing engineering, including subsea production facilities, two deepwater main flowlines, a shallow-water central platform (CEP), a shallow-water export pipeline, and an onshore gas plant. The subsea facilities lie in water depths ranging from 1,350 to 1,500 meters. The produced gas and fluids are transported to the CEP platform standing in shallow water of 190 meters via two deepwater flowlines of 75km for wet gas dehydration and condensate oil dehydration. The CEP Platform also receives dry gas from PY34-1/35-1/35-2 gas fields. The commingled gas will be compressed and transported to the onshore gas plant through the export subsea pipeline of 275km for further processing. Considering the gas field reserves, water depths, offshore distance, etc., it is technically difficult to develop these fields individually which are too marginal to have economic benefit. This deepwater gas development is to install subsea production system in deepwater gas field area and tie back to the CEP Platform in shallow water area to achieve a regional development for the deepwater and shallow water gas fields in the vicinity. This not only meets the requirement of deepwater gas field but also improves the economic benefit of shallow water gas fields.

The CEP platform is the key tie to connect facilities in deepwater and shallow water. By considering the every year wellhead pressures and the whole gas production, the process system design should combine the deepwater subsea pipeline flow, oil and gas dehydration system and oil and gas gathering transportation in shallow water CEP platform and pressure demand for light hydrogen reclamation in onshore terminal, so that the fields in shallow and deep water, subsea pipeline and CEP platform could be studied and assessed integrally and separately. Fig. 1 presents the CEP platform flow diagram of the LW3-1 Gas Field.

ARRIVING PRESSURE EFFECT ON THE PLATFORM PROCESS DESIGN

The arriving platform pressure is the outlet pressure of deepwater subsea pipeline which is also the operating pressure of gas/liquid receiving and separation system. According to the oil/gas/water gathering transportation study result of LW3-1 gas field by Wang (2009), considering transportation in production period, low gas flowrate recycle, pipeline pigging case and pipelaying resource in 1500km water deep and so on, two subsea pipelines with diameter of 558.8mm are designed to transport the fluid to the CEP platform for dehydration.

Based on wellheads data of LW3-1 gas field, the different arriving pressures effect on CEP platform process design is studied. Figure 2 shows the wellhead pressure, deepwater pipeline outlet pressure and calculated deepwater pipeline inlet pressure...